An Interdisciplinary Method for the Visualization of Novel High-Resolution Precision Photography and Micro-XCT Data Sets of NASA's Apollo Lunar Samples and Antarctic Meteorite Samples to Create Combined Research-Grade 3D Virtual Samples for the Benefit of Astromaterials Collections Conservation, Curation, Scientific Research and Education.

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New technologies make possible the advancement of documentation and visualization practices that can enhance conservation and curation protocols for NASA's Astromaterials Collections. With increasing demands for accessibility to updated comprehensive data, and with new sample return missions on the horizon, it is of primary importance to develop new standards for contemporary documentation and visualization methodologies.

Our interdisciplinary team has expertise in the fields of heritage conservation practices, professional photography, photogrammetry, imaging science, application engineering, data curation, geoscience, and astromaterials curation. Our objective is to create virtual 3D reconstructions of Apollo Lunar and Antarctic Meteorite samples that are a fusion of two state-of-the-art data sets: the interior view of the sample by collecting Micro-XCT data and the exterior view of the sample by collecting high-resolution precision photography data. These new data provide researchers an information-rich visualization of both compositional and textural information prior to any physical sub-sampling.

Since January 2013 we have developed a process that resulted in the successful creation of the first image-based 3D reconstruction of an Apollo Lunar Sample correlated to a 3D reconstruction of the same sample's Micro-XCT data, illustrating that this technique is both operationally possible and functionally beneficial. In May of 2016 we began a 3-year research period during which we aim to produce Virtual Astromaterials Samples for 60 high-priority Apollo Lunar and Antarctic Meteorite samples and serve them on NASA's Astromaterials Acquisition and Curation website.

Our research demonstrates that research-grade Virtual Astromaterials Samples are beneficial in preserving for posterity a precise 3D reconstruction of the sample prior to sub-sampling, which greatly improves documentation practices, provides unique and novel visualization of the sample's interior and exterior features, offers scientists a preliminary research tool for targeted sub-sample requests, and additionally is a visually engaging interactive tool for bringing astromaterials science to the public.